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ABSTRACT

Individuals often estimate the probability of future events by the ease with which they can recall or cognitively construct relevant instances. Previous research has not precisely identified the cognitive processes mediating this "availability heuristic." Two potential mediators (imagery of the event, perceived reasons or causes for the event) were examined using the 1984 presidential debate as the to-be-predicted event. College students (N=205) were randomly assigned to one of six conditions in a 2x3 factorial design. The first factor varied who won the debate, Reagan or Mondale. The second factor varied the cognitive availability of the debate outcome and reasons for the outcome. Subjects read scenarios which either described the debate and outcome (imagine condition), included plausible reasons for the outcome (reason condition), or a combination of both scenarios (imagine and reason condition). Subjects then answered questions on politics, the media, candidate preference, and an estimate of who would win the actual debate. The results indicated that debate predictions were affected by participants' candidate preferences and self-generated reasons. In addition, debate predictions were affected by the availability of reasons but not by imagery of the outcome. Simply imagining a winner had no effects on predictions, but considering reasons for the outcome did significantly affect predictions. These findings are consistent with research indicating the importance of causal thinking in judgment under uncertainty. (NRB)

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Mediators of the Availability Heuristic in
Probability Estimates of Future Events

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Abstract

Individuals often estimate the probability of future events by the ease with which they can recall or cognitively construct relevant instances. Previous research, however, has not precisely identified the cognitive processes mediating this "availability heuristic." We proposed two potential mediators: (1) imagery of the event itself, and (2) perceived reasons or causes for the event. We hypothesized that probability estimates are influenced by the latter but not the former. Using the 1984 presidential debate as the to-be-predicted event, we tested this hypothesis by manipulating debate outcome (Reagan vs. Mondale wins), imagery of the outcome, and reasons for the outcome in a factorial design. As hypothesized, debate predictions were affected by the availability of reasons but not by imagery of the outcome. Participants' self-generated reasons for the debate outcome, as assessed during the experiment by a thought-listing procedure, also affected debate predictions. The results are consistent with several lines of research indicating the importance of causal thinking in judgment under uncertainty.

Mediators of the Availability Heuristic in Probability Estimates of Future Events

Estimating the probability of future events is a crucial aspect of decision making. Prescriptive models, including the numerous variants of expected utility models (Schoemaker, 1982), require that the decision maker assess his or her subjective probability of possible decision outcomes (e.g., Behn & Vaupel, 1982; Keeney & Raiffa, 1976). In addition, descriptive analyses, which frequently show individuals departing substantially from prescriptive models, nevertheless demonstrate that individuals' expectations about future outcomes strongly affect their decisions (e.g., Abelson & Levi, 1985).

Given the importance of such expectations, a large amount of research has been devoted to understanding how individuals estimate the probability of future events. Evidence has accumulated that individuals often rely on a general cognitive strategy, the "availability heuristic" (Tversky & Kahneman, 1973). In using this heuristic, individuals estimate the probability of events by the ease with which they can recall or cognitively construct relevant instances. Since Tversky and Kahneman's (1973) initial demonstration experiments, other investigators have attempted to identify the specific cognitive processes underlying the availability heuristic (e.g., Billings & Schaalman, 1980; Carroll, 1978; Fiedler, 1983; Gabrielcik & Fazio, 1984; Gregory, Cialdini, & Carpenter, 1982; Hoch, 1983; Mehle, Gettys, Manning, Baca, & Fisher, 1981; Sherman, Cialdini,

Schwartzman, & Reynolds, 1985; Sherman, Skov, Hervitz, & Strock, 1981; Sherman, Zehner, Johnson, & Hirt, 1983). This research has led to an increasingly differentiated view of the availability notion, as investigators have examined several properties of recalled or constructed events, including their number, relative frequency, relevance, familiarity, recency, and salience (Billings & Schaalman, 1980).

An especially important distinction has been made between the retrieval of instances and the construction of examples or scenarios (Kahneman & Tversky, 1982). When estimating the frequency of past events, or of repetitive events for which a "track record" is available, individuals will tend to rely on retrieval of past instances. However, when estimating the probability of unique events, individuals cannot readily rely on this straightforward retrieval process; instead, they must somehow mentally construct the event and infer its probability (Beyth-Marom, Dekel, Gombo, & Shaked, 1985; cf. Howell & Burnett, 1978). Presumably, the more easily the event can be constructed or imagined, the higher the probability estimate the individual will assign to it.

How do individuals judge the ease of cognitively constructing an event? Two variables may be involved: (1) imagery of the event itself; and (2) perceived reasons or causes for the event. An event or outcome may be judged higher in probability to the extent that it is salient, vivid, or easy to imagine. For example, an individual who had recently seen the movie The Day

After (which vividly depicts the consequences of a nuclear war) might give higher estimates to the probability of a nuclear war. Alternatively, an event's perceived probability may be based primarily on the extent to which numerous reasons or causes for its occurrence can be retrieved or imagined. In this case, the perceived probability of a nuclear war might be related to the number of political scenarios an individual could imagine which might result in such an event.

Substantial evidence indicates the importance of both salience and causal reasoning in judgment (e.g., Anderson, 1983a, 1983b; Fiske, Pratto, & Pavelchak, 1983; Nisbett & Ross, 1980; Pryor & Kriss, 1977; Taylor, 1982; Taylor & Fiske, 1978). The role of these two variables in probability estimates of unique events, however, has received relatively little attention. In one previous study, Carroll (1978) tested the effects of imagining an event on expectations for the event. Using the 1976 Carter-Ford presidential election and the 1977 University of Pittsburgh football season as the to-be-predicted events, Carroll found that imagining a particular outcome increased subjective probability of the outcome. This effect occurred whether or not subjects generated reasons for why the outcome should occur. Consequently, Carroll concluded that cognitive availability of the outcome, rather than of reasons or causes for the outcome, was the crucial variable affecting probability estimates.

However, Carroll's manipulation of outcome availability included rather detailed scenarios for the election and football

season results. It is possible that subjects' probability estimates were affected primarily by the reasons and causes presented in these scenarios, rather than by mere imagery of the outcomes.

In the current study, we more clearly separated the availability of the outcome from the availability of reasons for the outcome. If availability or salience of the outcome is the crucial factor, simply imagining the outcome should increase probability estimates. On the other hand, if availability of reasons is crucial, then outcome imagery in the absence of supporting reasons should have no effect on probability estimates. On the basis of previous findings suggesting equivocal effects of outcome salience *per se* on judgments (e.g., Taylor & Thompson, 1982), we predicted that the estimated probability of an outcome would increase only when reasons for the event were provided. In addition, we predicted that the reasons spontaneously generated by individuals for an outcome would influence probability estimates of that outcome, independently of the hypothetical outcome or reasons explicitly manipulated in the experiment: the more reasons generated in favor of an outcome, the higher the probability estimates for that outcome.

We experimentally tested these predictions in the context of the first Reagan-Mondale presidential debate, which took place on October 7, 1984. The availability of the debate outcome, and of reasons for the debate outcome, was manipulated by providing

participants with written scenarios. We used a thought-listing procedure (Cacioppo & Petty, 1981) to measure participants' self-generated reasons for debate outcomes.

In a further exploration of potential availability effects, we obtained post-debate evaluations from the participants who had seen or heard the debate concerning who won the debate and how decisive the victory was. Though not a major focus of the study, these evaluations enabled us to determine whether the pre-debate availability manipulations affected participants' perceptions of the event itself. We considered two possibilities here. The first is a primacy or assimilation effect, in which preliminary reasons or imagery concerning a particular event will influence the interpretation of the event when it occurs. Thus an ambiguous stimulus will tend to be evaluated more favorably after the individual has previously focused on favorable reasons or imagery, and more negatively after he or she has previously focused on unfavorable reasons or imagery (Higgins & King, 1981; cf. Tesser, 1978). Thus in the present study, individuals who had received a Reagan-wins scenario would tend to evaluate Reagan's actual debate performance as better than would those who had received a Mondale-wins scenario.

The second possibility is a contrast effect: Having a highly available image of a particular outcome, or set of reasons for its occurrence, sets up a cognitive anchor, or reference point, by which actual outcomes are compared (Sherif & Hovland, 1961; cf. Tversky & Kahneman, 1974). Consequently, an actual

event will generally be evaluated less favorably if initial expectations were high than if they were low. Thus, for example, individuals whose expectations for a Reagan victory had been raised would tend to evaluate Reagan's actual debate performance as poorer than those whose expectations had not been raised.

Although substantial evidence exists for both priming and contrast effects in judgment, such effects have not been investigated in the context of probability estimates of future events and the subsequent evaluation of those events. We therefore had little basis for expecting one effect over the other.

Method

Participants were 205 students enrolled in introductory organizational behavior and psychology courses at two Midwestern universities. Four to six days before the first presidential debate, participants took part in a 15-minute in-class "exercise in judgment," in which they read a scenario about the upcoming debate and then answered a set of questions about the debate.

Each participant was randomly assigned to one of six conditions defined by a 2 x 3 factorial design. The first factor (Winner) varied who won the debate in the scenario, Reagan or Mondale.

The second factor (Availability) varied the cognitive availability of the debate outcome and reasons for the outcome. In the imagine outcome condition, participants read a scenario that "painted a picture" of the debate and its outcome. Summarizing, this scenario contained the following elements: (a) You are

watching the debate on television; (b) as the debate progresses, you get the distinct feeling that Reagan (Mondale) is scoring more points and making a better impression; (c) when the debate is over, you listen to what the news commentators and analysts have to say; (d) they unanimously describe the debate as a clear victory for Reagan (Mondale); (e) the next day, you check the newspaper headlines and note that they also describe the debate as a clear victory for Reagan (Mondale).

In the reasons condition, participants read a scenario of the debate which included several plausible reasons for why Reagan (Mondale) won the debate. The Reagan-wins scenario included the following reasons: (a) Reagan forcefully emphasizes the improvement in the economy--deregulation, new incentives for business expansion, and reduced inflation; (b) Reagan seems credible in stating that his budget-balancing attempts have been thwarted by the Democrats and their "big-spending" policies; (c) Mondale seems unpersuasive in proposing his own tax and deficit reduction plans; (d) throughout the debate, Reagan remains composed, assertive, and articulate, whereas Mondale appears uncertain and overly anxious to attack Reagan's credibility as an effective leader. The Mondale-wins scenario included the following reasons: (a) Mondale successfully points out the unfairness and long-term costs of Reaganomics, and hammers effectively on the budget deficit issue. (b) Mondale makes a strong and honest case for his own economic policies; (c) Reagan's attempts to blame the Democrats for the national debt seem self-serving

and not very credible; (d) throughout the debate, Mondale remains composed, assertive and articulate, whereas Reagan appears evasive and hazy on specifics.

In the imagine plus reasons condition, participants read essentially a combination of the other two conditions.

Each participant received a packet containing instructions and a scenario, followed by a blank page and a set of 11 questions. The instructions requested that the participant read the scenario carefully and imagine the events in it as clearly as possible. When participants finished reading and imagining their scenarios, they answered the 11 questions. Embedded within a set of filler items concerning politics and the media (e.g., "What medium has been your most important source of campaign information?") were an item on candidate preference and the key probability estimation item, "What is your best estimate of who is going to win the debate on October 7? ('winning' is defined as the consensus of commentators and analysts)." Predictions were expressed in terms of probability, with 0 = Reagan (Mondale) is sure to lose and 100 = Reagan (Mondale) is sure to win.

When participants finished answering the questions, they were asked to write down the thoughts they had had while reading about or imagining the debate as described in the scenario. Participants listed their thoughts separately on the blank sheet of paper.

Two to 4 days after the debate, participants who had watched

or heard the debate evaluated who had won. They answered a questionnaire containing the item, "In your opinion, what was the outcome of the debate?" by marking a 100-point scale, with 0 = clear victory for Reagan (Mondale), 50 = victory for neither, and 100 = clear victory for Mondale (Reagan).

Results

Candidate Preference Effects

Participants' candidate preferences had a strong effect on debate predictions. Mean predictions on the 100-point scale (100 = sure Reagan will win) were 69.07 for Reagan supporters, 57.50 for Mondale supporters, and 66.73 for the undecided and third-candidate supporters. This relationship was highly significant, $F(2, 184) = 16.1$, $p < .001$, with Newman-Keuls comparisons indicating that each mean differed from the others at $p < .05$. There were no interactions, however, between candidate preference and either of the two manipulated factors, $F_s < 1$.

Candidate preference, though measured after the experimental manipulation, was not affected by it. The relative proportions of participants preferring Reagan, Mondale, or a third candidate did not differ in the two scenario-winner conditions, [$\chi^2(2) = 3.2$, ns].

Availability Effects

Mean debate predictions for the experimental groups, broken down by candidate preference, are presented in Table 1. A 2 (winner) $\times$ 3 (availability) ANOVA revealed a significant main effect for winner, $F(1, 196) = 8.69$, $p < .005$. Averaging

across the three availability conditions, participants who received the Reagan-wins scenario gave higher probability estimates for Reagan winning ($M = 69.6$) than did participants who received the Mondale-wins scenario ($M = 63.1$). As predicted, however, this effect occurred only when reasons for the debate outcome were provided. Planned comparisons indicated no effect in the imagine outcome condition, $F(1, 196) < 1$, but significant effects in the reasons condition, $F(1, 196) = 5.18$, $p < .025$, and the imagine plus reasons condition, $F(1, 196) = 7.12$, $p < .01$. Figure 1 shows the nature of this interaction: in the imagine outcome condition, mean probability estimates of the debate outcome were nearly identical for both the Reagan-wins and Mondale-wins conditions. In contrast, in both the reasons condition and the imagine plus reasons condition, mean estimates in the two winner conditions diverged considerably.

 Insert Table 1 and Figure 1 about here

Effects of Self-generated Reasons

Participants' listed thoughts were coded by an individual unaware of the experimental purpose or conditions. The following coding categories were used: (1) reasons why Reagan would win the debate; (2) reasons why Mondale would win the debate; (3) reasons countering the scenario's depiction of Reagan winning the debate; (4) reasons countering the scenario's depiction of Mondale

winning the debate; (5) affects concerning Reagan; (6) affects¹ concerning Mondale; (7) thoughts unrelated to the debate.

For purposes of analysis, categories 1 and 4 were combined into a pro-Reagan category; categories 2 and 3 into a pro-Mondale category. These self-generated reasons were then combined into a ratio index as follows: $(\text{number of pro-Reagan reasons} + 1) \div (\text{number of pro-Mondale reasons} + 1)$. This index, used previously in a similar study by Anderson (1985), here indicates the relative proportion of pro-Reagan to pro-Mondale reasons. Scores of 1 indicate an equal number of pro-Reagan and pro-Mondale reasons; scores greater than 1 indicate a greater number of pro-Reagan than pro-Mondale reasons; and scores less than one indicate a² greater number of pro-Mondale than pro-Reagan reasons.

Three key questions concerning self-generated reasons were examined. First, were self-generated reasons influenced by the experimental manipulations and by candidate preference? Second, were they associated with predictions of the debate outcome, independently of the experimental manipulations? Finally, to what extent could self-generated reasons account for the effects of the experimentally manipulated variables?

Mean ratio index scores for the experimental groups broken down by candidate preference are presented in Table 2. A 2 (winner) x 3 (availability) x 3 (candidate preference) ANOVA revealed a marginally significant effect for scenario winner, $F(2, 184) = 2.88, p = .09$, and significant effects for availability, $F(2, 184) = 3.10, p = .048$ and candidate preference, F

(2,184) = 6.65, $p = .002$. There were no significant interactions among these variables. Combining across availability condition and candidate preference, participants who had received the Reagan-wins scenario generated a higher proportion of pro-Reagan reasons than did participants who had received the Mondale-wins scenario ($M_s = 2.05$ and 1.65 respectively). Mean scores within the availability conditions were 1.55 for the imagine outcome condition, 2.18 for the reasons condition, and 1.80 for the imagine plus reasons condition. Newman-Keuls comparisons revealed that these three means differed from each other at $p < .05$. Mean scores within candidate preference groups were: 2.10 for Reagan supporters, 1.27 for Mondale supporters, and 1.38 for the undecided and third-candidate supporters. Newman-Keuls comparisons revealed that the score for Reagan supporters differed significantly from those of the other two groups ($p < .05$).

Insert Table 2 about here

It is noteworthy that the mean ratio index is greater than 1 in all six experimental cells, indicating that participants generated a higher proportion of pro-Reagan than pro-Mondale reasons. It is apparent, nevertheless, that the relative preponderance of pro-Reagan reasons was systematically affected by the experimental manipulations and by candidate preference.

The number of reasons generated by participants was greater

in the reasons condition ($M = 1.96$) and the imagine plus reasons condition ($M = 2.00$) than in the imagine outcome condition ($M = 1.37$), $F(1,197) = 3.68$, $p < .03$. The number of affective thoughts generated by participants, however, did not differ across conditions, $F_s < 1.3$. Thus the presentation of reasons in the scenario had the specific effect of increasing participants' generation of reasons for a given debate outcome. In sum, then, both the content and the number of self-generated reasons were affected by the experimental variables.

Self-generated reasons were significantly associated with predictions of debate outcome. The overall correlation between the ratio index and debate prediction was $.29$, $p < .001$. The six within-cell correlations were all positive, and averaged $.25$ ($p < .001$), although the correlations in two imagine plus reasons conditions were nonsignificant.

To further examine the effect of self-generated reasons on debate predictions, a three-point scale was formed from the ratio index, according to whether the index was greater than 1 (indicating preponderance of pro-Reagan reasons), 1 (indicating equal number of pro-Reagan and pro-Mondale reasons), or less than 1 (indicating preponderance of pro-Mondale reasons). This index defined the third independent variable (self-generated reasons) in a 2 (scenario winner) $\times 3$ (availability) $\times 3$ ANOVA, which revealed significant main effects for scenario winner, $F(1,184) = 6.14$, $p < .015$, and self-generated reasons, $F(2, 184) = 15.19$, $p < .001$. Overall, self-generated reasons accounted for

substantially more variance in debate predictions than did scenario winner, $\eta^2_s = .38$ and $.20$ respectively.

Insert Table 3 about here

Table 3 presents the mean debate predictions by experimental condition and self-generated reasons. It is evident that self-generated reasons were strongly associated with predictions in the imagine outcome conditions, where, it should be recalled, the winner variable had no effect (Figure 1). These results, in conjunction with the overall significant within-cell correlation, suggest that self-generated reasons affected debate predictions independently of the manipulated variables.

Given that the self-generated reasons exerted an independent effect on debate predictions, it is unlikely that such reasons can account fully for the scenario winner and availability effects. Nevertheless, it remains possible that self-generated reasons can account for a portion of these effects. To assess this possibility, an analysis of covariance (ANCOVA) was conducted on debate predictions, with scenario winner and availability as independent variables and the self-generated reasons ratio index as a covariate. To the extent that partialling out the effect of self-generated reasons reduces the effects of the independent variables, it can be concluded that

self-generated reasons mediate these latter effects (cf. Anderson, 1985).

The ANCOVA revealed that controlling for self-generated reasons reduced, but did not eliminate, the overall effect of scenario winner, $F(1, 195) = 5.98, p = .015$. A more detailed examination of the covariance analysis showed that the scenario winner effect was reduced to a nonsignificant level in the reasons condition, $F(1, 63) = 2.10, p > .20$, but remained significant in the imagine plus reasons condition, $F(1, 66) = 8.51, p = .005$. Thus self-generated reasons accounted for much of the scenario winner effect when the scenario provided only reasons for the debate outcome, but for little of the effect when the scenario provided reasons plus an imaginable outcome.

To determine approximately what portion of the experimental effects was accounted for by self-generated thoughts, we compared the mean debate predictions unadjusted and adjusted for self-generated thoughts. Overall, the scenario winner effect (i.e., the difference between predictions in the Reagan-wins and Mondale-wins conditions) was 6.46. After partialling out self-generated reasons, the adjusted mean difference was 5.24. Thus approximately 19% $((6.46 - 5.24)/6.46)$ of the overall scenario winner effect was accounted for by self-generated thoughts. Within the reasons condition and the imagine plus reasons condition, self-generated thoughts accounted for 31% and 3% of the effect respectively.

Evaluations of Debate Outcome

Of the initial sample of 205 participants, 111 (about 54%) subsequently watched or heard the debate. Evaluations of the debate outcome on a 100-point scale (0 = clear victory for Mondale; 50 = victory for neither; 100 = clear victory for Reagan) were solicited from these participants. These evaluations were matched up with the corresponding predictions by participant name or code number. Approximately equal numbers of responses (from 16 to 22) were obtained within each of the six experimental conditions.

A 2 (winner) x 3 (availability) x 3 (candidate preference) ANOVA conducted on the debate evaluations revealed a significant effect for candidate preference, $F(2, 94) = 6.75$, $p < .005$, and a marginally significant effect for winner, $F(1, 94) = 2.87$, $p < .10$. There were no significant interaction effects. Mean post-debate evaluations were 41.9 for Reagan supporters, 29.4 for Mondale supporters, and 33.7 for the undecided and third-candidate supporters. Thus although all groups perceived the debate as a victory for Mondale, the perceived decisiveness of the victory was strongly affected by candidate preference.

Participants who had received the Reagan-wins scenario evaluated the debate outcome as a more decisive victory for Mondale ($M = 35.3$) than did participants who had received the Mondale-wins scenario ($M = 41.0$). This result suggests a contrast effect, in which the debate outcome was evaluated

against the initial expectations raised by the scenario. However, initial expectations alone do not account for the result: The effect of winner on debate outcome evaluation remained significant ($p < .05$) after covarying on predictions of debate outcome.

Discussion

The current study compared the effects of two cognitive variables--the availability of a future outcome and the availability of reasons for the outcome--on probability estimates of that outcome. The results suggest that predictions of an outcome are affected by the availability of reasons but not by the availability of the outcome alone. Simply imagining Reagan or Mondale winning the presidential debate had no effect on predictions of who would win the debate. However, imagining or considering reasons for why Reagan or Mondale would win the debate did significantly affect predictions.

Alternative Explanations

Before we discuss the implications of the study, there are two alternative explanations for the results that should be considered. The first alternative invokes experimental demand characteristics. Participants may have inferred that the scenarios were intended to influence their debate predictions, and responded accordingly. This explanation is implausible because it cannot easily account for the interaction effect, in which scenario winner influenced predictions in the reasons and reasons plus imagine conditions but not in the imagine outcome

condition. There is no reason why demand characteristics should have differential effects across the three availability conditions. Moreover, previous research by Gregory et al. (1982) showed experimentally that demand characteristics do not adequately account for the effects of imagery on probability estimates.

The second alternative explanation is that differential involvement in the scenarios across the three availability conditions accounted for the results. Specifically, participants may have been more involved in the scenarios in which reasons were provided than in those in which only the outcome was described. According to this explanation, the winner variable had no effect in the imagine outcome condition because participants in this condition were insufficiently involved to process the information fully.

No direct measures of participant involvement were collected during the experiment. However, the number of thoughts listed by the participants can serve as an indicator of involvement: presumably, the more thoughts listed, the higher the level of involvement. Although participants generated significantly fewer reasons in the imagine outcome condition than in the other two conditions, they generated approximately equal numbers of affective responses in all three conditions. It is thus reasonable to conclude that psychological involvement in the scenarios was not significantly different across the availability conditions.

Mediators of the Availability Effect

The results suggest that causal reasoning plays an important role in individuals' probability estimates of future events. When individuals were provided with reasons for a particular outcome, their probability estimates for that outcome increased. In contrast, when individuals simply imagined a particular outcome, their probability estimates were not affected. In addition, the types of reasons individuals spontaneously generated also affected (or were associated with) probability estimates. The greater the preponderance of reasons generated in favor of a Reagan or Mondale debate victory, the higher the probability estimates respectively of a Reagan or Mondale victory.

Analysis of the self-generated reasons provides additional information about potential mediators of the availability effects. First, it is clear that the scenarios affected the debate-relevant reasons generated by the participants. Reagan-wins and Mondale-wins scenarios evoked proportionately more pro-Reagan and pro-Mondale reasons, respectively. This effect was especially apparent in the reasons and the imagine plus reasons conditions. The scenarios in these two conditions built upon widely-recognized images and information about the two candidates. For example, the Reagan-wins scenario depicted Reagan emphasizing the economic benefits of deregulation, and Mondale appearing overly anxious in his attempts to attack Reagan's credibility. The Mondale-wins scenario depicted Mondale

attacking Reaganomics, and Reagan appearing evasive and hazy on specifics. Because the reasons provided by these scenarios were consistent with prior images of the candidates, it may have been easy for participants to generate additional reasons consistent with the depicted debate outcome. Participants may then have used the ease of generating these additional reasons as a cue for inferring the probability of the outcome. Scenarios in the imagine outcome condition prompted less cognitive elaboration, and therefore had little effect on probability estimates.

Second, although self-generated reasons were associated with probability estimates, the results of the ANCOVA suggest that such reasons did not account fully for the significant winner effect. Controlling for self-generated reasons reduced, but did not eliminate, the overall effect. One explanation is that the thought-listing procedure does not provide a completely reliable measure of self-generated reasons (cf. Taylor & Fiske, 1981). This explanation is quite likely, in fact, because participants listed their thoughts after they had given their probability estimates of the debate outcome. Another possibility is that the scenarios influenced probability estimates through some unmeasured variable that was correlated with self-generated reasons.

Third, detailed examination of the ANCOVA results suggests that outcome imagery may also affect probability estimates, provided that it occurs in conjunction with causal reasoning about the outcome. Specifically, the winner effect was reduced to a

nonsignificant level in the reasons condition but remained highly significant in the imagine plus reasons condition. Self-generated reasons accounted for 31% of the winner effect in the reasons condition, but for only 3% in the imagine plus reasons condition. This suggests that vividly imagining an outcome, after thinking about reasons for its occurrence, may stabilize a probability estimate or increase its persistence. This possibility could be tested in future research.

Effects of Candidate Preference on Predictions

The significant effect of candidate preference on debate predictions is consistent with the "wishful thinking" and "optimism" effects found in a wide variety of judgment and prediction tasks (e.g., McGuire, 1960; Slovic, 1966; Weinstein, 1980; cf. Milburn, 1978). More desirable events tend to be seen as more probable, a robust effect that may have both cognitive and motivational sources. Carroll (1978), who also found a significant candidate preference effect in his study of election predictions, suggested possible cognitive mediators: Individuals who prefer a particular candidate may be exposed to a biased sample of opinions, or may imagine the desired event (i.e., election of the preferred candidate) more often, thus making it more available and subjectively more likely.

In the present study, it is possible to examine self-generated reasons as potential cognitive mediators of the candidate preference effect. Self-generated reasons were strongly affected by candidate preference, as Reagan supporters and

Mondale supporters generated a greater proportion of pro-Reagan and pro-Mondale reasons respectively. However, as was the case with the other experimental effects, self-generated reasons did not account fully for the candidate preference effect. An ANCOVA with the self-generated reasons ratio index as the covariate reduced, but did not eliminate the effect, which remained highly significant ($p = .006$). Nevertheless, caution is advisable in interpreting this result as ruling out cognitive mediators of the candidate preference effect. The thought-listing procedure may have only partially captured participants' actual reasoning, or other unmeasured cognitive processes may have mediated the effect.

Evaluations of Debate Outcome

Consistent with the consensus of news commentators and analysts (e.g., Merry & Perry, 1984), participants who watched or heard the debate perceived that Mondale had won. However, Mondale supporters perceived a significantly more decisive Mondale victory than did Reagan supporters, with the perceptions of the undecided and third-candidate supporters in between. This favorable perception of the debate performance of one's own candidate is a common and widespread finding (e.g., Kinder & Sears, 1985). Evaluating the results of a political debate is a somewhat subjective task. Personal preferences are therefore likely to affect the evaluations, especially if the evaluation criteria have not been specified and clarified for the viewer.

Evaluations of the actual debate outcome were also affected

by who was depicted as the winner in the scenarios. There was a marginally significant tendency for those who had received the Reagan wins scenario to perceive a more decisive Mondale victory than did those who had received the Mondale wins scenario. This effect suggests that when imagining or thinking about the scenario, participants developed an initial expectation of how the debate would turn out. This expectation could have served as a standard against which the candidates' debate performances were judged. Thus Mondale's actual debate performance would have been judged more positively by those expecting a Reagan victory than by those expecting a Mondale victory. The results thus suggest a contrast rather than a primacy or assimilation effect. This interpretation must remain tentative, however, because the effect was not very strong, and remained significant after debate predictions were accounted for.

Relation to Previous Findings

The results are consistent with several lines of research in the area of judgment and probability estimation. First, research on probability estimation under uncertainty has demonstrated the importance of causal thinking. When formal models for computing the probability of future events are lacking, individuals rely on intuitive models or heuristics in which causal reasoning plays a key role. For example, Kahneman and Tversky (1982) suggested that individuals often estimate outcome probabilities by mentally running a simulation model containing events high in causal significance. Subjective probability of the outcome will be high

to the extent that the outcome seems to follow inevitably from the events in the hypothetical scenario.

In the current study, the hypothetical scenario was provided for the participants rather than created by them. Nevertheless, the results are consistent with the "simulation heuristic." Predictions of the target outcome (i.e., the debate) were influenced by hypothetical, but causally significant events (e.g., Reagan forcefully emphasizing the improvement in the economy; Mondale appearing overly anxious in attacking Reagan's credibility). In contrast, scenarios that lacked such causally significant events did not affect probability estimates.

A second area in which causal reasoning plays an important role is that of Bayesian inference. In Bayesian inference tasks, individuals must estimate the probability of some target event (e.g., sales of a new product) on the basis of base rate information (e.g., past sales of similar new products) and specific case information (e.g., the attributes of the new product, such as its quality and novel features). A general finding in studies of performance on such tasks is that individuals tend to ignore or underutilize base rate information (e.g., Bar-Hillel & Fishhoff, 1981). However, when individuals can interpret the base rate causally, they do tend to integrate it into their probability estimates (e.g., Ajzen, 1977; Tversky & Kahneman, 1982). Once again, it is the causal significance of the information that affects people's probability estimates.

Causal reasoning has also been implicated in belief

perseverance--the tendency for people to cling to initial beliefs to an unwarranted extent. Anderson (1985) showed that unwarranted beliefs tend to persist to the extent that causal reasons for the belief are cognitively available to the individual. Even after the belief has been discredited, prior causal reasoning continues to exert an influence. A similar cognitive process may underlie the "hindsight" bias, in which past events, however surprising at the time of their occurrence, come to seem inevitable in retrospect (Fischhoff, 1982). The sense of inevitability derives from the intuitive causal models that individuals use to explain past events.

The experimental results are also consistent with previous research on the judgmental effects of information vividness. Taylor and Thompson (1982), in a review of research on vividness, found little support for the notion that vividly presented information has a disproportionate impact on judgments. Vividness per se appears to play a relatively unimportant role in judgment. In contrast, other variables, such as information value, have much more significant effects on judgment.

In the current study, the imagine-outcome condition can be considered a type of vividness manipulation, in which an imaginable outcome was portrayed, but without supporting "evidence." In accord with Taylor and Thompson's review, judgments were unaffected by this manipulation.

Another relevant finding comes from Billings and Schaalman's (1980) study of school principals' probability estimates of

desegregation outcomes in a field setting. Billings and Schaalman investigated the effects of several characteristics of recalled events, including number, relative frequency, relevance, familiarity, drama, and recency. In general, the variables that reflected the vividness or salience of past events--familiarity, drama, and recency--were only weakly related to probability estimates of desegregation outcomes. These variables did not contribute unique variance to the estimate once number of recalled events was controlled for. In contrast, the relative frequency and relevance of recalled events did affect estimates. These latter characteristics have causal implications for future outcomes. The school principals evidently attached greater importance to information that was causally significant than to information that was merely vivid or salient.

In sum, then, the current findings are consistent with much previous research on judgment and probability estimation. Probability estimates are affected by the availability of causally significant reasons or information. Mere outcome availability, on the other hand, has little effect on probability estimates. The results refine our understanding of the availability heuristic and the potential for bias that its use entails.

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Footnotes

1 .

A subsample of 20 randomly selected thought listing protocols were recoded by the second author as a reliability check. Intercoder agreement was 87%.

2

A simple difference score index (number of pro-Reagan reasons minus number of pro-Mondale reasons) correlated .93 with the ratio index. Analyses performed on both indexes produced practically identical results.

Table 1

Mean Debate Predictions as a Function of the Experimental Variables and Candidate Preference

Candidate preference	Scenario winner						M
	Reagan			Mondale			
	Imagine	Reasons	Imagine plus	Imagine	Reasons	Imagine plus	
	outcome		reasons	outcome		reasons	
Reagan	66.4 (21)	74.0 (28)	72.5 (23)	66.1 (23)	68.1 (23)	65.3 (18)	69.1
Neither	62.5 (4)	80.0 (2)	76.0 (5)	60.6 (5)	60.0 (1)	63.0 (5)	66.7
Mondale	62.1 (7)	55.0 (3)	58.4 (5)	62.5 (6)	53.9 (9)	55.2 (12)	57.5
M	65.0	72.6	70.9	64.6	64.0	61.5	

Note. Predictions are on a scale from 0 = sure Mondale will win to 100 = sure Reagan will win.
Numbers in parentheses are cell ns.

Table 2

Mean Self-generated Reason Ratios as a Function of the Experimental Variables and Candidate Preference

Scenario winner							
Candidate preference	Reagan			Mondale			
	Imagine	Reasons	Imagine plus	Imagine	Reasons	Imagine plus	M
	outcome		reasons	outcome		reasons	
Reagan	1.71 (21)	2.74 (28)	2.12 (23)	1.58 (23)	2.12 (23)	2.17 (18)	2.10
Neither	1.37 (4)	1.25 (2)	1.74 (5)	1.43 (5)	1.00 (1)	1.10 (5)	1.38
Mondale	1.36 (7)	1.87 (3)	1.47 (5)	1.28 (6)	1.05 (9)	1.10 (12)	1.27
M	1.59	2.55	1.96	1.51	1.79	1.65	

Note. Ratios indicate proportion of pro-Reagan to pro-Mondale reasons. Numbers in parentheses are cell ns.

Table 3

Mean Debate Predictions as a Function of the Experimental Variables and Self-generated Reasons

	Scenario winner						
	Reagan			Mondale			
Self-generated reasons	Imagine outcome	Reasons	Imagine plus reasons	Imagine outcome	Reasons	Imagine plus reasons	M
Predominantly pro-Reagan	72.9 (14)	74.8 (24)	73.4 (18)	69.3 (15)	70.6 (17)	62.1 (18)	70.7
Neutral	63.1 (14)	67.0 (6)	68.8 (11)	65.4 (11)	61.7 (9)	67.5 (12)	65.5
Predominantly pro-Mondale	50.0 (5)	66.7 (3)	65.0 (4)	54.8 (8)	50.7 (7)	44.2 (6)	53.6

Note. Predictions are on a scale from 0 = sure Mondale will win to 100 = sure Reagan will win.

Numbers in parentheses are cell ns.

Figure Caption

Figure 1. Mean debate predictions as a function of scenario winner and availability condition.

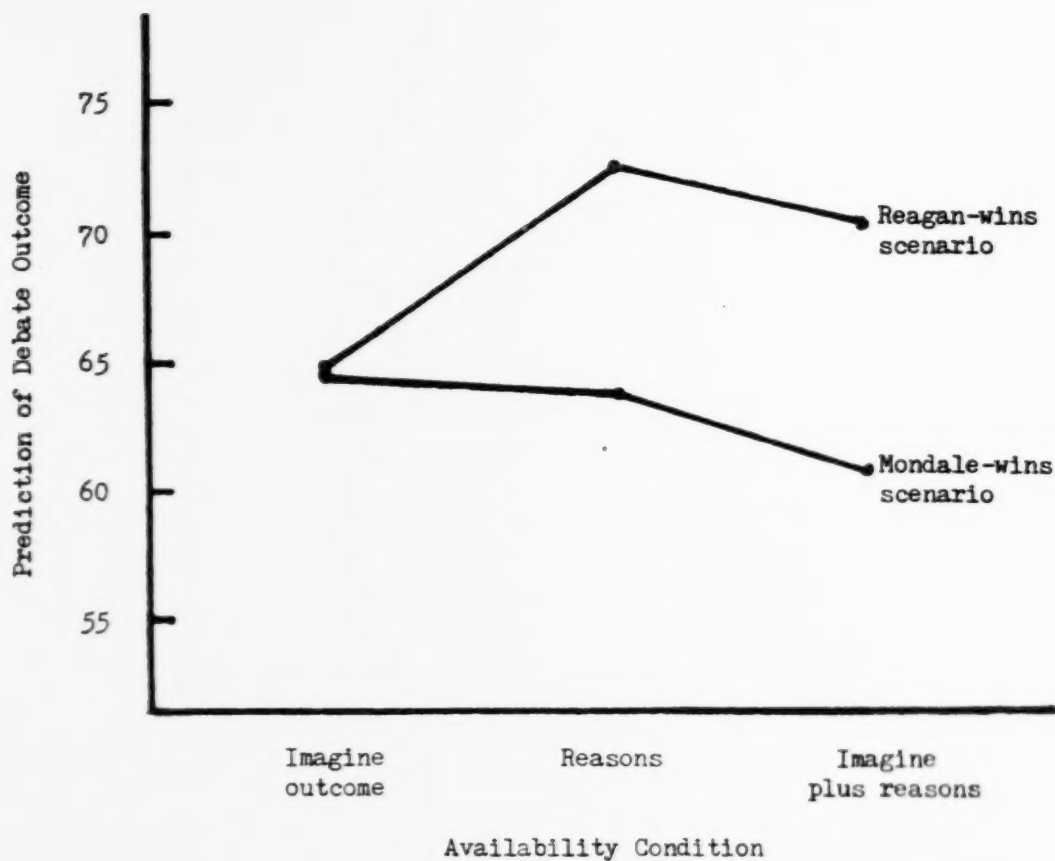


Figure 1. Mean debate predictions as a function of scenario winner and availability condition.

Note. On the scale, 0 = sure Mondale will win and 100 = sure Reagan will win.